



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10

1200 Sixth Avenue
Seattle, WA 98101

Reply To
Attn Of: ECL-115

MEMORANDUM

SUBJECT: Engineering Evaluation/Cost Analysis for the Midnite Mine Haul Route Operable Unit of the Midnite Mine Superfund Site, Stevens County, Washington

FROM: Ellen Hale
Remedial Project Manager/On-Scene Coordinator

THROUGH: Chris Field, Manager
Emergency Response Unit

TO: Michael F. Gearheard, Director
Office of Environmental Cleanup

EXECUTIVE SUMMARY

Scope

This engineering evaluation/cost analysis (EE/CA) addresses radionuclide contamination at a portion of the Midnite Mine Superfund Site, Stevens County, Washington. The goal of the EE/CA is to evaluate alternatives for the purpose of selecting an appropriate response action to address spills of uranium-bearing ore.

The response action described in this EE/CA will be conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA). This EE/CA has been prepared in accordance with the National Contingency Plan (NCP) and the U.S. Environmental Protection Agency's (EPA) *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (EPA, 1993).

Background

The Midnite Mine is an inactive open-pit uranium mine in the Selkirk Mountains of eastern Washington. Located within the reservation of the Spokane Tribe, the mine was operated almost continuously from

1955 until 1981. Initial studies and enforcement efforts intended to result in reclamation of the mine were conducted by various agencies in the United States Department of Interior starting in the mid-1980's. The site was proposed to the National Priorities List (NPL) in 1999, with a final rule the following year. EPA is performing a Remedial Investigation and Feasibility Study to characterize the mined area and areas affected by migration of contaminants through surface water, ground water, and air transport.

Ore from Midnite Mine was transported about 25 miles to the Dawn Mining Company mill in Ford, Washington, which is located immediately outside the reservation boundaries. The ore haul route includes two gravel roads (part of the mined area) and a portion of the Ford-Wellpinit road, the primary east-west thoroughfare on the reservation. Since 1992, a water treatment system has been treating contaminated mine drainage water at Midnite Mine. Sludge from this process is transported to the mill along the same road. Until a recent change in the license requirements, the sludge was processed at the mill to extract uranium and disposed in a tailings disposal area (TDA-4).

Although the Ford-Wellpinit road has been paved for many years, the slopes, curves and surface conditions of the road during the years ore was transported may have varied. The Spokane Tribe reported that pieces of ore were often lost from the haul trucks in transit and raised concerns over potential environmental and health risks from the spilled material. EPA's Radiation and Indoor Environments National Lab (RIENL) performed a gamma radiation survey along the road in September 1999 and confirmed the presence of spilled ore.

The Haul Route operable unit (OU) is part of the Midnite Mine Superfund Site. This OU is distinct from other OUs in that the contaminated materials fell from trucks hauling the mined ore along public roads. Contamination that moved from Midnite Mine through environmental transport mechanisms or through spillage along the unpaved haul roads on leased lands at the Mine are being studied under the remedial investigation/feasibility study (RI/FS). As such, the characterization and proposed response action for this OU are being managed separately from the Midnite Mine RI/FS.

Removal Action Alternatives

Four alternative response actions were considered for the Haul Route OU:

- No Action (baseline),
- Excavation of the spilled material, transportation to Midnite Mine, and staging for remediation with other Midnite Mine Materials,
- Excavation of the spilled material and transportation to and disposal at an off-site disposal facility, and
- In situ containment of spilled material and long-term institutional controls.

Recommended Removal Action Alternative

The four potential response actions were evaluated and screened with respect to implementability, effectiveness, and cost. Based on the findings of the individual and comparative analyses, the recommended response action is Alternative B (*Excavation of spilled material, transportation to Midnite Mine, and staging for remediation with other Midnite Mine materials*).

I. INTRODUCTION

This engineering evaluation/cost analysis (EE/CA) addresses radionuclide contamination at a portion of the Midnite Mine Superfund Site, Stevens County, Washington. The goal of the EE/CA is to evaluate alternatives for the purpose of selecting an appropriate response action to address spills of uranium-bearing ore.

The response action described in this EE/CA will be conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA). This EE/CA has been prepared in accordance with the National Contingency Plan (NCP) and the U.S. Environmental Protection Agency's (EPA) *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (EPA, 1993).

II. SITE CHARACTERIZATION

The Haul Route operable unit (OU) is part of the Midnite Mine Superfund Site. This OU is distinct from other OUs in that the contaminated materials fell from trucks hauling the mined ore along public roads. Contamination that moved from Midnite Mine through environmental transport mechanisms or through spillage along the unpaved haul roads on leased lands at the Mine are being studied under the remedial investigation/feasibility study (RI/FS). As such, the characterization and proposed response action for this OU

are being managed separately from the Midnite Mine RI/FS.

a. Site description and background

The Midnite Mine is an inactive open-pit uranium mine in the Selkirk Mountains of eastern Washington. Located within the reservation of the Spokane Tribe, the mine was operated almost continuously from 1955 until 1981. Initial studies and enforcement efforts intended to result in reclamation of the mine were conducted by various agencies in the United States Department of Interior starting in the mid-1980's. The site was proposed to the National Priorities List (NPL) in 1999, with a final rule the following year. EPA is performing a Remedial Investigation and Feasibility Study to characterize the mined area and areas affected by migration of contaminants through surface water, ground water, and air transport.

Ore from the mine was transported about 25 miles to the Dawn mill in Ford, Washington, which is located immediately outside the reservation boundaries. The ore haul route includes two gravel roads (part of the mined area) and a portion of the Ford-Wellpinit road, the primary east-west thoroughfare on the reservation. Since 1992, a water treatment system has been in operation to address contaminated mine drainage water at Midnite Mine. Sludge from this process is transported to the mill along the same road. Until a recent change in the license requirements, the sludge was processed at the mill to extract uranium and disposed in a tailings disposal area (TDA-4).

Although the Ford-Wellpinit road has been paved for many years, the slopes, curves and surface conditions of the road during the years ore was transported may have varied. The Spokane Tribe reported that pieces of ore were often lost from the haul trucks in transit and raised concerns over potential environmental and health risks from the spilled material. EPA's Radiation and Indoor Environments National Lab (RIENL) performed a gamma radiation survey along the road in September 1999 and confirmed the presence of spilled ore.

b. Previous removal and response actions

No previous removal actions have been performed at the Haul Route OU.

c. Source, nature, and extent of contamination

The source of the ore is spillage from trucks hauling ore from Midnite Mine to Dawn Mill. The survey located seventeen (17)

anomalously high gamma radiation readings along the Ford-Wellpinit road (Enclosure A - excerpts). The radioactive anomalies identified include visibly identifiable spilled ore, the gravel haul roads at the mine, mineralized granite in a road cut, two gravel driveways surfaced with crushed rock (potentially from Midnite Mine), and the residue of spilled fine material. The fine material may be water treatment system sludge spilled in transit to the mill; however, it could also be the residue from the weathering of spilled ore. EPA does not propose to address gravel roads or in-situ native rock through this removal action. EPA proposes to address only visibly identifiable spilled ore and fine material that may be residue of spilled ore.

d. Analytical data

EPA's Radiation and Indoor Environments National Lab (RIENL) performed a gamma radiation survey along the road in September 1999. Analytical samples of ore were not collected, but a scanner van carrying a sodium iodide radiation detector was used to identify radiation anomalies along the road. Where anomalies were noted, RIENL personnel used hand-held radiation meters to locate the source and confirm the readings with a Ludlum Model 19 Micro-R survey meter (EPA-RIENL 1999).

EPA contractors followed up with a brief field visit (memo from Dave Nicholson of URS, November 14, 2000) to obtain global positioning system coordinates for the anomalies, measure the gamma radiation from waist height (for assessing human exposure) for some anomalies, and expand on the RIENL description of the anomalies.

Excluding the haul roads and the mill access road, where gamma readings were in the thousands of $\mu\text{R/hr}$, anomalies on the roadside ranged from 50 to 340 $\mu\text{R/hr}$ (at contact with the source). Subsequent waist-high readings of up to 240 $\mu\text{R/hr}$ *relative to background* were observed. Figure 1 of the RIENL report shows the locations of the anomalies, while Figure 2 documents the readings taken in background areas, along the gravel haul roads at Midnite Mine and at Dawn Mill, and on both sides of the paved Ford-Wellpinit road haul route.

e. Streamlined risk evaluation

The spilled ore is of human health concern from the standpoint of cancer risk arising from human exposure to external gamma radiation. The elevated gamma levels considered anomalous are two or more times the average level measured along unaffected roadways on the reservation. Houses on the reservation are spread out, with driveways or small roads leading to the main thoroughfares; people

wait at the end of their driveways for rides or buses, especially school children. Utility and road workers may work along the road, and local residents may walk to school, to town, or to a neighbor's house on the road margins.

The sodium iodide detector in the RIENL scanner van provided readings in counts per second, while confirmatory hand measurements were in microR per hour ($\mu\text{R/hr}$). Human exposure to radiation (dose rate) is usually expressed in terms of millirems per year (mrem/yr). Conveniently, in the case of gamma radiation one mrem is approximately equivalent to 1000 microR (μR).

To assess the need for cleanup, EPA estimated the radiation exposure as an average along the Ford-Wellpinit roadside and compared it to background. Background gamma in this area has been variously estimated at 10 to 25 $\mu\text{R/hour}$, incorporating local readings of 30 - 50 $\mu\text{R/hr}$ where mineralized granite is exposed at road cuts or outcrops. (For the RI/FS, EPA contractors will be using 22.3 $\mu\text{R/hour}$ as the background limit, statistically the 95% upper tolerance limit.) EPA used 25 $\mu\text{R/hour}$ for this analysis.

Based on the graphic readout from the RIENL survey, up to 20% of the Ford-Wellpinit road was estimated to have radiation exposures averaging twice the background value (50 $\mu\text{R/hr}$) due to the anomalies, with 80% of the road averaging 25 $\mu\text{R/hr}$. Thus, the average gamma exposure along the Ford-Wellpinit road would be 30 $\mu\text{R/hr}$, approximately 5 $\mu\text{R/hour}$ in excess of background.

Assuming worker exposure (2000 hours/year), this average radiation exposure would result in a dose rate of approximately 10 mrem/year . This dose rate over thirty years corresponds to an excess cancer risk of approximately 2×10^{-4} , approaching the upper end of the Superfund risk range. Exposure to someone using the roadside area for 2 hours a day would result in a dose rate of less than 4 mrem/year , or roughly 9×10^{-5} . These estimates are unavoidably inexact, due to uncertainties in the RIENL data, radiation risk coefficients, exposure assumptions, and other variables. However, they indicate that there is potential human health risk from exposure to these materials. It should be noted that radiation exposures greater than the above estimated values could result if close contact with discrete quantities of the ore occurs for similar durations. The discrete nature of the material also provides potential for a variety of unnecessary types of exposure. For instance, children may be attracted to the ore, which is yellowish due to its uranium content, and pick it up.

VI. IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

A general radiation protection practice is to reduce unnecessary radiation exposure to levels that are As Low As Reasonably Achievable (ALARA). Following this principle, the cleanup objective for these localized, discrete radiation anomalies is to eliminate their role in elevating radiation exposure above background levels for users of roadside areas.

a. Statutory limits on removal actions

The proposed CERCLA response action is expected to be performed by the PRPs. Thus, the statutory limits (ceiling and duration) for fund-financed actions do not apply.

b. Scope of the response action

This removal action will address only radioactive material spilled from trucks hauling materials from Midnite Mine to the Dawn Mill.

c. Determination of the removal schedule

This removal action can take place only when the roads are clear of snow and ice. It will be conducted as soon as possible in 2003, and will be scheduled in coordination with the Spokane Tribe to minimize impacts of the removal on road traffic, either by a compressed period of field activity or by extending the period and working during non-peak road use hours.

d. Planned remedial activities

Once the spilled ore has been addressed through this removal action, EPA anticipates that no further action will be needed for the roadside spills along the Ford-Wellpinit road or other public roads. No remedial activities are anticipated for this OU. The Midnite Mine and mine-affected areas will be addressed by the RI/FS and, as necessary, will be remediated pursuant to a Record of Decision (ROD).

e. ARARs

Section 300.415(i) of the National Contingency Plan (NCP) requires that the proposed action attain applicable or relevant or appropriate requirements (ARARs) under federal, state, or tribal environmental laws or facility siting laws, to the extent practical, considering the exigencies of the situation. Other To-Be-Considered (TBC) materials such as federal, state, or tribal

advisories, criteria, or guidance may, as appropriate, be considered in formulating the removal action.

A brief discussion of ARARs is presented below.

- US DOT Hazardous Materials Regulations, 49 CFR Parts 171, 172, and 173 - While not applicable to the spilled materials, which do not exceed 2000 pCi/g limit, certain controls on transport methods may be relevant and appropriate.
- WAC 245-250-170 - Protection of the general population from releases of radioactivity - This state law specifies annual dose limits for the public which must not be exceeded as a result of concentrations of radioactive material which may be released to the general environment. It also states that reasonable effort should be made to maintain releases of radioactivity "as low as reasonably achievable." State laws may be relevant and appropriate, but are not applicable for actions on the Spokane reservation.
- WAC 246-247-040 - (Radon air emissions) and WAC 173-480-040 (Ambient standard). These regulations establish specific standards for radioactive air emissions. These emission standards are not applicable since this removal is on the Spokane Reservation, but are relevant and appropriate.
- Resource Conservation Recovery Act (RCRA), 42 U.S.C. 6901 et seq. RCRA governs the generation, management and disposal of solid and hazardous waste. The ore material being addressed by this removal is not regulated as a hazardous waste under RCRA, but is regulated as a solid waste under RCRA. The RCRA regulations governing solid waste are applicable to the removal action to the extent that material is moved beyond the area of contamination.
- Uranium Mill Tailings Radiation Control Act (UMTRCA) 42 U.S.C. 2014-2201, 7901 - 7924 and implementing regulations, 40 C.F.R. 192. UMTRCA provides standards for controlling residual radioactive material at uranium mills and tailings disposal sites to protect public health and environment. This includes specific concentration levels for radium concentrations relative to background levels. These regulations are only applicable to inactive uranium processing sites and are

not applicable to the unprocessed ore that is being addressed by this removal. However, the performance standards for concentration limits for protection of human health set forth in 40 CFR 192 could be relevant and appropriate at this Site. Since this removal action is removing ore based on background levels and is not creating a permanent disposal site, EPA has determined that these regulations are not relevant and appropriate for this removal action.

- Atomic Energy Act (AEA), 42 U.S.C. 2001-2296 and implementing regulations, 10 C.F.R. 61. AEA governs the management and processing of radioactive material that meets the definitions of source material, special nuclear material or byproduct material. The unprocessed ore that is being addressed by this removal does not meet these definitions. Therefore, these regulations are not applicable to this removal action, but could be relevant and appropriate. Since this removal action is removing ore based on background levels and is not creating a permanent disposal site, EPA has determined that these regulations are not relevant and appropriate for this removal action.
- Off-Site Rule - EPA's Off-Site Rule has three main requirements for facilities receiving Superfund wastes: the facility must be in compliance with RCRA or other applicable federal or state requirements; at hazardous waste management facilities, the waste management unit receiving those wastes must not currently and should not be expected to release contaminants into the environment, while releases from other units must be controlled; and at other than hazardous waste management facilities, environmentally significant releases must be controlled. The party performing a cleanup that involves off-site disposal should contact the EPA regional office for the region where the disposal facility is located and request a determination under the Off-Site Rule. Material staged at Midnite Mine would not be subject to this rule.

VIII. IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Four removal action alternatives are identified for evaluation.

Alternative A - No Action (baseline)

Spilled materials will remain along roadsides, thus continuing as a potential pathway for direct radiation exposure to humans. Over many years, the materials will weather and merge with the native materials, adding to gamma radiation levels along the road but becoming harder to isolate and address. This alternative has minimal costs, but would not achieve ALARA.

Alternative B - Excavation of spilled material, transportation to Midnite Mine, and staging for remediation with other Midnite Mine materials

Under this alternative, identifiable accumulations of spilled material would be excavated by hand or with a small backhoe, and transported to a prepared staging area at the Midnite Mine. The staged materials, which will be protected against surface water run-on and run-off and wind erosion, will be addressed when a final remedy is selected by the Midnite Mine ROD.

Spilled material would be excavated using readily available equipment and personnel trained in handling hazardous substances, including radioactive materials. Replacement materials are likely necessary but limited, because of the relatively small volume of material to be excavated. The excavation volume is estimated to be 50 - 100 cubic yards. Readily available radiological monitoring equipment would be used to verify the effectiveness of the removal actions. Short-term construction impacts, such as dust from excavation and transportation of contaminated soils, will be addressed through implementation of best management practices (BMPs).

Direct capital costs (such as labor, equipment, and materials) and indirect capital costs (such as engineering expenses), are estimated to be less than \$150,000, provided the PRPs conduct the action. Conduct of the response is estimated to be completed within 30 days of field mobilization. Annual operations and maintenance costs (O&M), are considered negligible.

Alternative C - Excavation of spilled material and transportation to and disposal at an off-site disposal facility

This alternative is the same as Alternative B, except that excavated materials would be transported to an off-site commercial disposal facility. Transportation of contaminated materials may present greater short-term impacts because of additional handling and loading requirements and the distances traveled; however, these impacts could be controlled by BMPs.

Direct capital costs (such as labor, equipment, and disposal) and indirect capital costs (such as engineering expenses), are estimated to be less than \$250,000, provided the PRPs conduct the action. Conduct of the response is similarly estimated to be completed within 30 days of field mobilization.

Alternative D - In-situ containment of spilled ore and long-term institutional controls

Under this alternative, identifiable accumulations of spilled ore would be contained in-situ through placement of a suitable barrier, such as gravel, soil, and/or vegetative barrier. Where necessary, surface water controls such as culverts and grading, would be required to control surface water run-on and run-off. Institutional controls (ICs), such as restrictions on activities that might disrupt protective barriers, signs and notices, long-term monitoring and maintenance, and educational programs, would be necessary to protect human health.

Direct capital costs (such as labor, equipment, and materials) and indirect capital costs (such as engineering) are estimated to be less than \$150,000, provided the PRPs conduct the action. Conduct of the response is similarly estimated to be completed within 30 days. However, there would be additional costs, such as materials and labor for O&M related to the barriers and administrative costs for institutional controls. The costs associated with implementation and maintenance of ICs will be largely dependent upon the scope of the program and the extent to which the program can be built upon an existing program. The administrative and physical components of such a program would not be expected to exceed approximately 25% of the direct capital costs on an annual basis.

IX. ANALYSIS OF REMOVAL ACTION ALTERNATIVES IN TERMS OF IMPLEMENTABILITY, EFFECTIVENESS, AND COST

The No Action alternative, while readily implementable, is unacceptable because the alternative is not protective of human health and the environment and does not achieve ALARA. The alternative would require minimal capital or O&M costs.

Alternative B (*Excavation of spilled ore, transportation to Midnite Mine, staging for remediation with other Midnite Mine materials*) is implementable and would be effective in preventing direct contact and eliminating the potential for contaminant mobilization. Interim disposal at Midnite Mine would be effective in the short term, provided there is proper construction and maintenance; however, construction of interim storage does not offer a long-term solution for management of the wastes. Interim disposal at the Midnite Mine would present low to moderate capital costs, depending on construction requirements and the haul distance to the facility. O&M costs pending construction of a remedy at Midnite Mine would be minimal, and subsequent O&M would be rolled in with O&M for the overall remediation at Midnite Mine.

Alternative C (*Excavation of spilled ore, transportation to and disposal in approved landfill*) is implementable and would be effective in preventing direct contact and eliminating the potential for contaminant mobilization. Off-site transportation of contaminated materials increases the short-term exposure potential to workers and residents along the transportation route as well as increasing traffic and wear and tear on local roads. Relative capital costs would be high to very high depending on the contaminant concentrations of the material, licensing and permitting fees, and the haul distance to the facility.

Alternative D (*In-situ containment of spilled ore and long-term institutional controls*) is implementable for all identified barrier materials. Such materials would be effective in preventing direct contact and restricting contaminant mobilization by wind and water erosion if the materials are suitable, if the containment is properly designed, constructed, and maintained, and if institutional controls can be developed to protect the integrity of the containment. Some materials may have to be excavated and consolidated with other accumulations found elsewhere where such removals are minimal or where it is necessary or desirable to maintain the existing surface grade or establish drainage paths. ICs are readily implementable and may require establishment of new local ordinances or regulations to ensure that the ICs can be

enforced in a consistent manner. The relative costs for barriers and O&M are expected to be low to moderate and the relative costs for ICs are low capital and moderate O&M costs.

X. COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

a. Implementability

Removal and disposal of ore accumulations is readily implementable. The practicality of a new on-site interim staging area is potentially limited by siting considerations. Disposal in existing off-site facilities is implementable within constraints of capacity and waste acceptance criteria. Acceptability to communities will be assessed during the public comment period.

Construction of protective barriers is readily implementable. Gravel and/or soil may be potentially unstable in steeply sloping areas of roadway. Localized consolidation may be necessary.

Implementability of institutional controls, which would depend upon governmental ordinances or regulations and cooperation by governmental agencies, is uncertain. Educational programs must be frequent and in-place for a sufficient period of time.

b. Effectiveness

Removal and disposal of ore accumulations is effective in mitigating direct exposure and mobility concerns, but not in reducing volume or toxicity. Short-term effectiveness is negatively affected by transportation considerations. Off- and on-site disposal alternatives would be effective in reducing direct exposure potential and mobility, but not overall volume or toxicity. Off- and on-site disposal alternatives would be effective long-term provided there is proper O&M. Interim storage not effective in long-term.

Protective barriers are effective in providing a physical barrier against direct exposure and will mitigate wind or water mobilization of ore. Long-term effectiveness will depend on appropriate choice of materials for intended use and local setting and conditions; performance of ongoing O&M; and implementation of ICs. Protective barriers are effective in reducing mobility, but not in reducing toxicity or volume, and their effectiveness may be difficult to ensure on lands under individual private ownership.

ICs are effective provided the implementing entity has the

opportunity to monitor, maintain, and enforce. They may include education, controls on use and access, and restrictions on intrusive activities. They reduce direct exposure, but not toxicity, mobility, or volume.

c. Cost

Direct costs for removals will depend on material volume and access to removal area. Indirect costs will depend on the extent of temporary activities necessary to avoid short-term impacts. O&M costs should be low for the interim staging area. Direct costs for consolidation, if necessary, are low. Direct costs for new, on-site interim staging area may be moderate to high, and O&M costs associated with the area are estimated to be low. Direct costs for off-site disposal are likely very high.

Direct costs for barriers will depend on choice of material and construction conditions, but are likely low to moderate.

Direct costs for ICs will depend on nature and extent of ICs, and whether new or expansion of existing program.

XI. RECOMMENDED REMOVAL ACTION ALTERNATIVE

The recommended removal action is Alternative B (*Excavation of spilled material, transportation to Midnite Mine, and staging for remediation with other Midnite Mine materials*). Alternative B is recommended because:

- Excavation and disposal is protective of human health and is compliant with ARARs.
- Excavation removes the material from roadside areas where it is contributing to gamma radiation levels to which the public is exposed. Excavation and disposal is anticipated to be the final action for the OU.
- Disposal of the material at Midnite Mine is appropriate because the spilled ore came from the mine and has the same characteristics as ore, protore, and waste rock currently stockpiled at the Mine. The small volume of the spilled ore is not anticipated to affect future remedial costs at the Midnite Mine.

Concurrence on EE/CA for Midnite Mine Haul Route Removal Action		
E Hale	C Mackey	S Kawabata